## ABSTRACT

### ESTIMATION OF EVAPOTRANSPIRATION USING ATMOSPHERICALLY RESISTANT VEGETATION INDEX (ARVI) IN CAGAYAN RIVER BASIN

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Tropical areas like Cagayan River Basin where vegetation is usually found to be abundant are expected to have higher transpiration than evaporation by 40-50% of the total evapotranspiration. In an area as large as Cagayan River Basin, the measurement of actual loss of water by evapotranspiration area can be very difficult, costly, and time consuming. To overcome these challenges, this study subscribes to the idea that evapotranspiration can be indirectly measured using Atmospherically Resistant Vegetation Index (ARVI). ARVI is an image transformation index that minimizes artefacts associated with atmospheric effects and aerosol, resulting to a good detection of vegetation condition. MOD 13 Vegetation Products and meteorological data from January 1, 2000 to December 31, 2009 were used to predict evapotranspiration in Cagayan River Basin. Results show that ARVI has strong correlation with actual evapotranspiration in Aparri ($R=0.64$, $p<0.01$), Tuguegarao ($R=0.54$, $p<0.01$), and ISU-EC stations ($R=0.52$, $p<0.01$). Using these relationships, ARVI is used to predict evapotranspiration and results suggest that at least 40% of changes in predicted evapotranspiration in the three stations can be explained by changes in their vegetation condition. Correlation and significance tests between ARVI-predicted evapotranspiration and pan evaporation observed in ISU-EC station indicate that ARVI-predicted evapotranspiration is correlated with pan evaporation at $R=0.64$ ($p<0.01$) with a goodness of fit (chi-square) of$X2=0.08$, and a standard error of estimate (SEE) of 0.08. Moreover, ARVI-predicted ET is highest in densely vegetated areas found in the eastern part of the basin while values are low in industrial and agricultural areas. Similarly, ARVI-predicted ET is highest in the months of March, April, and May and lowest in October, November, and December. Finally, this study articulates that while ARVI provides promising accuracy in predicting evapotranspiration, an exploration of extended study timeframe, integration and gathering of aerosol information, and use of high temporal and high-spatial resolution satellite images are necessary to fully understand the application of ARVI and its relationship with evapotranspiration.